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U.S. Application No. 10/766,823

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A storage system coupled to a host computer comprising:

a plurality of control units each connected with a respective disk unit and controlled to read/write data sent from the host computer from/to the respective disk unit,

each of the plurality of the control units including

a replication creation unit being adapted to create a replication of the data of a logical volume relating to the disk unit connected with the corresponding control unit; and

a plurality of volume pair information corresponding to the plurality of the control units, respectively, each of the volume pair information designating an original volume and a replication volume,

wherein the replication creation unit of a first control unit operates in such a manner that

in the case where a replication of an original volume, relating to the disk unit connected to the first control unit, is created in the logical volume relating to the disk unit connected to the first control unit, the volume information of the original volume and the volume information of the replication volume are registered in the volume pair information, ~~and a~~ and the replication is created in the logical volume

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relating to the disk unit connected to the first control unit based on the volume pair information, and

in the case where a replication of an original volume, relating to the disk unit connected to the first control unit, is created ~~in the~~ in a logical volume relating to the disk unit connected to a second control unit, the volume information of the original volume, ~~a virtual~~ virtual volume information of a virtual replication volume virtualized in the disk unit connected to the first control unit, ~~being not corresponded to the disk unit connected to the first control unit and being corresponded to at least one logical volume of the second control unit while the host computer can recognize that a replication volume corresponds to the disk unit connected to the first control unit, and the~~ and information on the second control unit are registered in the volume pair information, and a request to create a replication is transmitted to the second control unit based on the volume pair information when a replication request is sent from the host computer for creating the replication volume in the disk unit connected to the first control unit, wherein the virtual volume information of the virtual replication volume includes a volume number of a volume virtualized in the disk unit connected to the first control unit but for which no volume is created in the disk unit connected to the first control unit, and wherein the host computer recognizes the replication volume created in the logical volume relating to the disk unit connected to the second control unit as having been created in the logical volume relating to the disk unit connected to the first control unit; and

wherein, in the case where the replication volume is created in the logical volume relating to the disk unit connected to the second control unit, a replication data of the original logical volume is transferred from the first control unit

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to the at least one logical volume of the second logical unit based on the volume pair information.

2. (original) A storage system according to Claim 1,

wherein each of the control units includes a cache memory for temporarily storing the data; and

wherein the replication creation unit of the first control unit, in creating a replication in the volume of the disk unit connected to the second control unit, copies the data of the original volume as a data for the replication volume in the cache memory of the first control unit, and transmits the copy data in the cache memory to the second control unit.

3. (previously presented) A storage system according to Claim 2,

wherein the second control unit stores the data received from the first control unit in the cache memory of the second control unit, after which the data is stored in the volume relating to the disk unit connected to the second control unit.

4. (original) A storage system according to Claim 1,

wherein the volume information of the replication volume of the first control unit registered in the volume pair information by the first control unit in the case where a replication is created in the volume of the disk unit connected to the second control unit is virtual ID information for identifying, in the first control unit, the volume of the disk unit connected to the second control unit; and

wherein the information on the second control unit registered in the volume pair information by the first control unit in the case where a replication is

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created in the volume of the disk unit connected to the second control unit is ID information for identifying, in the second control unit, the second control unit and the replication volume of the disk unit connected to the second control unit.

5. (original) A storage system according to Claim 1,

wherein the volume pair information includes an identifier assigned to the volume pair of the original volume and the replication volume, and

wherein one or a plurality of the identifiers are assigned to the one original volume.

6. (original) A storage system according to Claim 1,

wherein the replication creation unit registers information in the volume pair information based on selected one of the information input from a user input/output apparatus and a host command received from a host.

7. (original) A storage system according to Claim 1,

wherein each of the control units further includes a plurality of normal read/write processing queues corresponding to the plurality of the control units, respectively, each of the queues being adapted to form a schedule for a normal read/write request, and a plurality of low job priority queues corresponding to the plurality of the control units, respectively, each of the low job priority queues being adapted to form a schedule for a request low in job priority than the normal read/write request;

wherein in the case where a request for creating a replication is processed equivalently to the normal read/write request, the control unit places a

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request for creating a replication in the normal read/write processing queue, while in the case where a request for creating a replication is processed in the order of priority lower than the normal read/write request, the control unit places the replication creation request in the low job priority queue.

8. (original) A storage system according to Claim 1,

wherein each of the control units further includes a plurality of job priority set units corresponding to the plurality of the control units, respectively, each of the job priority set units determining the job priority information as to whether a request for creating a replication is to be processed equivalently to the normal read/write request, the job priority set unit notifying the job priority order information to the other control units, and

wherein a control unit that has received the notification of the job priority information from other control units forms a schedule for sequentially processing the requests based on the job priority information thus received.

9. (original) A storage system according to Claim 1,

wherein in the case where the first control unit transmits a request for creating a replication to the second control unit, the information indicating a replication creating process is added to the control instruction for transmitting the replication creation request, and

wherein the second control unit that has received the control instruction determines whether the request is to be processed in priority, based on the information indicating a replication creation process, and forms a schedule for sequentially processing the requests.

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10. (original) A storage system according to Claim 1,

wherein in the case where the first control unit transmits a request for creating a replication to the second control unit, the information indicating the priority order is added to the replication creation request, and

wherein the second control unit determines as to whether a replication creation request is processed in priority based on the received information indicating the priority, and forms a schedule for sequentially processing the replication creation requests.

11. (currently amended) A method of creating a replication in a storage system coupled to a host computer, the storage system including a plurality of control units each connected with a respective disk unit and controlled to read/write data sent from the host computer from/to the respective disk unit, comprising the steps of:

registering in a first control unit original volume information and replication volume information as volume pair information, in the case where a replication of the data of an original volume in a logical volume relating to the disk unit connected to the first control unit is created in the logical volume relating to the disk unit connected to the first control unit;

registering in the first control unit the original volume information, ~~a virtual~~ virtual volume information of a virtual replication volume virtualized in the disk unit connected to the first control unit, ~~being not corresponded to the disk unit connected to the first control unit and being corresponded to at least one logical volume of the second control unit while the host computer can recognize that a~~

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~~replication volume corresponds to the disk unit connected to the first control unit, and~~
information on a second control unit has in the volume pair information of the first
control unit, in the case where a replication of the data of an original volume, the
~~volume~~ relating to the disk unit connected to the first control unit, is created ~~in the in~~
a logical volume of the relating to the disk unit connected to the second control unit,
wherein the virtual volume information of the virtual replication volume includes a
volume number of a volume virtualized in the disk unit connected to the first control
unit but for which no volume is created in the disk unit connected to the first control
unit;

generating in the first control unit a replication of the original volume
relating to the disk unit connected to the first control unit, based on the volume pair
information, in the case where a replication of the data of the original volume relating
to the disk unit connected to the first control unit is created in the logical volume
relating to the disk unit connected to the first control unit; and

sending from the first control unit a replication creation request to the
second control unit based on the volume pair information when a replication request
is sent from the host computer for creating the replication volume in the disk unit
connected to the first control unit, in the case where a replication of the data of the
original volume in the logical volume relating to the disk unit connected to the first
control unit is created in the logical volume ~~of the relating to the~~ disk unit connected
to the second control unit, wherein the host computer recognizes the replication
volume created in the logical volume relating to the disk unit connected to the
second control unit as having been created in the logical volume relating to the disk
unit connected to the first control unit; and

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wherein, in the case where the replication is created in the logical volume relating to the disk unit connected to the second control unit, a replication data of the original logical volume is transferred from the first control unit to the at least one logical volume of the second logical unit based on the volume pair information.

12. (original) A replication creation method according to Claim 11,
wherein each of the control units has a cache memory for storing the data temporarily,
the method further comprising the steps of copying in the first control unit the data of the original volume to the cache memory of the first control unit, and sending from the first control unit the data stored in the cache memory to the second control unit.
13. (previously presented) A replication creation method according to Claim 12, further comprising the steps of:
storing, in the second control unit, the data received from the first control unit into the cache memory of the second control unit, and
storing, in the second control unit, the data in the cache memory of the second control unit into the volume relating to the disk unit connected to the second control unit.

14. (previously presented) A replication creation method according to Claim 11,

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wherein in the case where a replication is created in the volume of the disk unit connected to the second control unit, the volume information of the replication volume in the first control unit to be registered by the first control unit in the volume pair information is virtual ID information for identifying, in the first control unit, the volume of the disk unit connected to the second control unit, and

wherein in the case where a replication is created in the volume of the disk unit connected to the second control unit, the information on the second control unit to be registered by the first control unit as volume pair information is the information for identifying the second control unit and the information for identifying, in the second control unit, the replication volume relating to the disk unit connected to the second control unit.

15. (original) A replication creation method according to Claim 11,

wherein the volume pair information includes an identifier assigned to the pair of the original volume and the replication volume, and

wherein one or a plurality of identifiers are assigned to each original volume.

16. (original) A replication creation method according to Claim 11,

wherein the first control unit registers the information in the volume pair information based on selected one of the information input from a user input/output apparatus and a host command received from the host.

17. (original) A replication creation method according to Claim 11,

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wherein a storage system comprising a plurality of control units each including a normal read/write processing queue to schedule the normal read/write request, and a low job priority queue to schedule the request lower in priority than the normal read/write request, and

wherein in the case where a replication creation request is processed equivalently to the normal read/write request, the control unit places the replication creation request in the normal read/write processing queue, while in the case where a replication creation request is processed in a priority lower than the normal read/write request, the replication creation request is placed in the low job priority queue.

18. (original) A replication creation method according to Claim 11,

wherein the storage system has a job priority set unit for each of the control units,

wherein the job priority set unit of the first control unit sets the job priority as to whether a replication creation request is to be processed equivalently to a normal read/write request, and notifies the job priority information to the second control unit, and

wherein the second control unit forms a schedule for sequentially processing the replication creation requests based on the job priority information thus received.

19. (original) A replication creation method according to Claim 11,

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wherein the first control unit transmits a replication creation request to the second control unit with the information indicating a replication creating process, and

wherein the second control unit determines whether the received replication creation request is to be processed in priority or not, based on the information indicating a replication creation process, and forms a schedule for sequentially processing the replication creation requests.

20. (original) A replication creation method according to Claim 11,

wherein the first control unit transmits a replication creation request to the second control unit with the information indicating the order of priority, and

wherein the second control unit determines whether the replication creation request is to be processed in priority or not, based on the information indicating the order of priority, and forms a schedule for sequentially processing the replication creation requests.

21. (previously presented) A storage system according to Claim 1, wherein in the case where a replication is created in the volume relating to the disk unit connected to the second control unit, the replication creation unit of the first control unit issues to the second control unit a request to write the data corresponding to the virtual replication volume to the at least one logical volume of the second control unit corresponding to the virtual replication volume.

22. (previously presented) A replication creation method according to Claim 11, wherein the step of sending a replication creation request from the first control

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unit to the second control unit includes sending a request to write data from the virtual replication volume in the first control unit to a logical volume corresponding thereto in the second control unit.